Biomass Productivity Dynamics Monitoring and its Drivers in Sahelian Croplands and Rangelands to Support Food Security Policies

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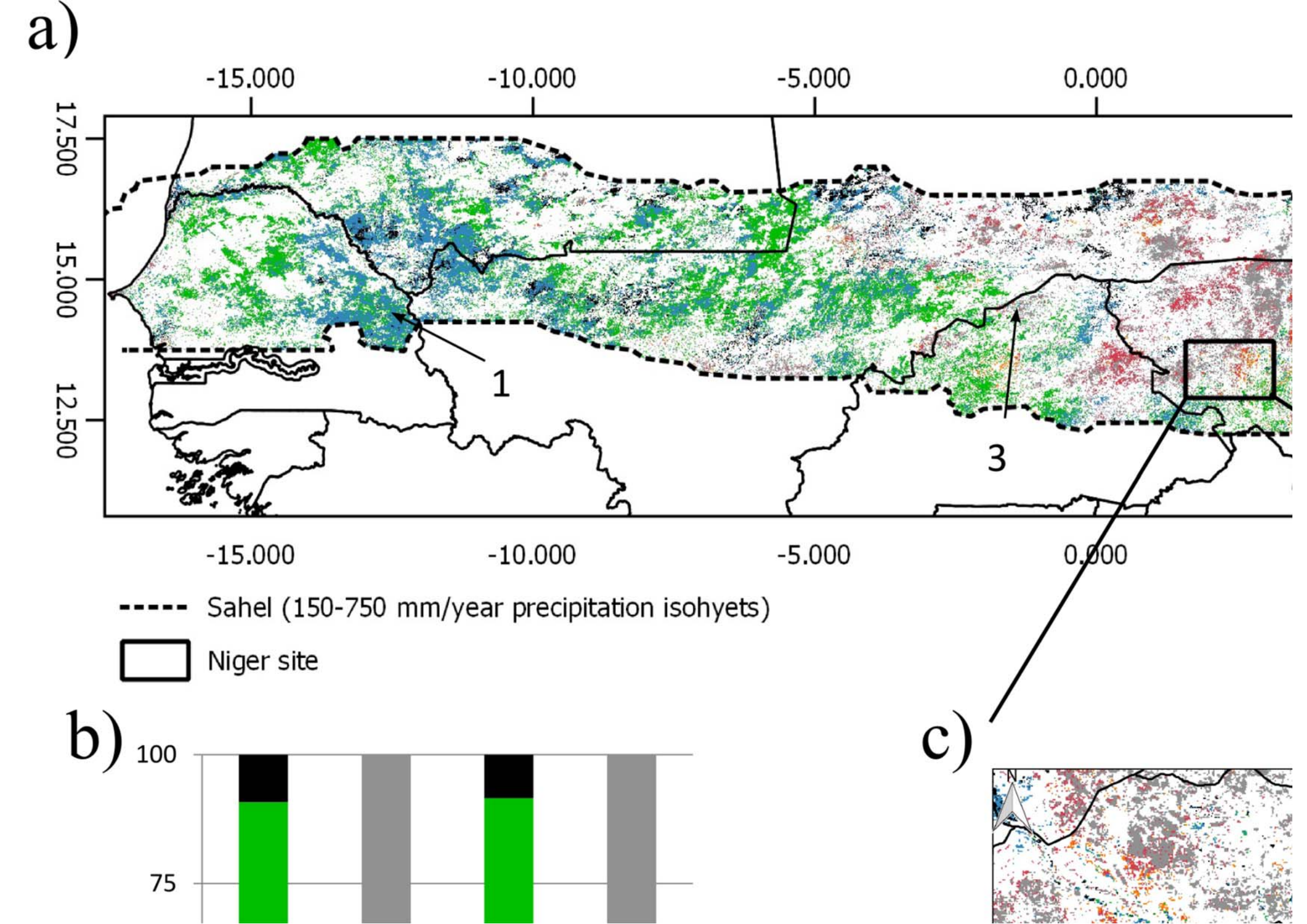
Abstract

Since the Sahelian population livelihood relies mainly on agropastoral activities, accurate information on biomass productivity dynamics and the underlying drivers are needed to manage a wide range of issues such as food security. This study aims to contribute to a better understanding of these drivers in rangeland and cropland, both at the Sahel and local scales (an agropastoral site in South-West Niger). At the Sahel scale, the MODIS Land Cover product was used to extract cropland and rangeland pixels. By analyzing MODIS NDVI trends together with TRMM3B43 annual rainfall (2000-2010), we developed a new classification scheme allowing to identify areas of persistent decline/improvement in biomass productivity and to separate rainfall-driven dynamics from other factors. The results showed an overall increase of productivity in the rangeland, and both an improvement and a degradation in the cropland. We found strong evidence that the increase in biomass productivity was generally linked to increasing rainfall, while the decrease could be attributed chiefly to other factors exclusively or to a combination of both climate- and human-induced factors (see the attached Figure). At the Niger site scale, biomass trends have been put in relation with a set of potential drivers via a RandomForest model, to define which were the explanatory factors of the observed trends. The factor set covered 5 categories: climate, natural constraints, demography, physical accessibility and land cover changes. We highlighted that tiger bushes areas were particularly prone to pressure due to overgrazing and overexploitation of wood, while positive trends were mainly observed near rivers and in fossil valleys where new agricultural practices might have been promoted. The approach developped here could help to delineate areas with decrease in crop and grassland production and thus to assess the vulnerability of the population, but also to target zones with good potential for planning long-term food security policies.


a)
-15.000
-10.000
-5.000
0.000
17.500
15.000
12.500
1
3
Sahel (150-750 mm/year precipitation isohyets)
Niger site
b)
100
75
c)
N

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